NON-PUBLIC?: N
ACCESSION #: 9211300253
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Sequoyah Nuclear Plant, Unit 1 PAGE: 1 OF 06

DOCKET NUMBER: 05000327

TITLE: Reactor Trip As a Result of a Relay Not Changing State in a Feedwater Regulating Valve Controller
EVENT DATE: 10/26/92 LER #: 92-018-00 REPORT DATE: 11/24/92

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 081

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
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COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: SJ COMPONENT: RLY MANUFACTURER: P297
REPORTABLE NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

On October 26, 1992, at 1855 Eastern standard time, with Unit 1 in power operation at approximately 81 percent, the reactor tripped because of a turbine trip. The turbine trip resulted from a high-high feedwater level in the No. 3 steam generator. Before the trip, water was inadvertently introduced into the nonessential control air system, inducing secondary plant transients that resulted in turbine runbacks to 81 percent for Unit 1 and 67 percent for Unit 2. Before the Unit 1 turbine runback, steam generator No. 3 was experiencing low feedwater level. The unit operator placed the Loop No. 3 feedwater regulating valve flow indicating controller (FIC) in manual, attempting to gradually raise feedwater level. The valve went to full open, and attempts to close the valve were unsuccessful, resulting in a high-high steam generator level. The immediate cause of the trip was attributed to the automatic-manual switching relay (K-1) in the FIC not changing state; however, the water intrusion in the air system initiated the transient that eventually led

to the trip. The unit was stabilized in the hot standby condition. The K-1 relays in the four Unit 1 feedwater regulating-valve FICs were replaced. The FICs were tested and returned to service.

END OF ABSTRACT

I. PLANT CONDITIONS

Unit 1 was in power operation at approximately 81 percent power.

II. DESCRIPTION OF EVENT

A. Event

On October 26, 1992, at 1855 Eastern standard time (EST), the reactor tripped because of a turbine trip that resulted from a high-high feedwater level in the No. 3 steam generator (EIIS Code SJ). Before the trip, water was inadvertently introduced into the control air system (EIIS Code LF), inducing secondary plant transients that resulted in turbine runbacks from full power to 81 percent and 67 percent power on Unit 1 and Unit 2, respectively. Before the Unit 1 turbine runback, steam generator No. 3 was experiencing low level because of irregular feedwater regulating valve (FRV) (EIIS Code SJ) operation. This was a result of water intrusion into the pneumatic control system of the FRV. The unit operator placed the flow indicating controller (FIC) (EIIS Code JB) in manual for the steam generator No. 3 FRV to attempt to gradually raise the level. The automatic-manual switching relay (K-1) for this FIC did not change state, causing the manual control circuit to be electrically inoperable. This condition resulted in the FRV going to the full open position and not responding to the manual changes to the controller input. Attempts to close the valve were unsuccessful, resulting in a high-high steam generator level.

B. Inoperable Structures, Components, or Systems That Contributed to the Event

Each shift an operator opened the moisture trap bypass valve on the nonessential control air receiver to blow out any accumulated sediment and condensate. This also checked the receiver's moisture trap operation. However, an equalizing line associated with the trap provided a short circuit for the

blowdown process, rendering the blowdown technique ineffective. Air flow traveled through the equalizing line, through the trap, and out the bypass line.

Before the trip, operators were isolating the No. 1 nonessential control air receiver to support valve repair on the receiver's moisture trap bypass valve. This configuration forced system air flow through the No. 2 receiver where condensate had accumulated because of sediment build-up obstructing the drain line, and water was introduced into the nonessential control air system. Approximately 1,000 gallons of water were entrained; however, a significant amount of water was rejected at the nonessential control air dryers. When the air dryers saturated, they automatically blew down and sprayed water onto the floor. The saturation of the air dryers caused the nonessential control air

system pressure to drop, resulting in an automatic isolation of the essential control air system. Some water was carried over to end-use devices. The first components affected by the water entrainment were the Unit 1 FRVs. As the water progressed through the nonessential control air system, the No. 3 heater drain tank level controllers were affected. The Unit 1 and later the Unit 2 No. 3 heater drain tanks bypassed to the condenser, resulting in turbine runbacks on each unit. Unit 2 stabilized after the runback.

C. Dates and Approximate Times of Major Occurrences

October 26, 1992 An assistant unit operator (AUO) began
at 1835 EST isolation of EST the No. 1 nonessential
control air receiver to facilitate valve
repair on the receiver's moisture trap
bypass valve.

October 26, 1992 The AUO was closing the last valve
at 1840 necessary for EST isolation of the
receiver. He heard abnormal noises and
observed water spraying out of the station
air dryers. The AUO immediately informed
the assistant shift operations supervisor
(ASOS). The No. 1 non
ssential control air
receiver was returned to normal alignment.

October 26, 1992 Steam flow-feedwater flow mismatch and low
at 1846 EST feedwater level in the No. 3 steam
generator were annunciated on the main
control room panels. The unit operator
immediately placed the No. 3 FRV FIC in
manual and attempted to increase feedwater
flow. The FRV failed in the full open
position.

October 26, 1992 Multiple alarms were annunciated on the
at 1851 main control room panels (steam generator
No. 3 level high).

October 26, 1992 Turbine runback was initiated as a result
at 1848 EST of the No. 3 heater drain tank level bypass
valve opening to the condenser. The
runback was complete in approximately 45
seconds.

October 26, 1992 Additional alarms were annunciated on the
at approximately 1849 EST main control room panels.

October 26, 1992 An ASOS and AUO were at the No. 3 FRV,
at approximately attempting to reduce flow by utilizing the
1851 EST mechanical dogging device on the valve.

October 26, 1992 The turbine tripped as a result of a
at 1855 EST high-high level in the No. 3 steam
generator. The turbine trip initiated a
reactor trip.

D. Other Systems or Secondary Functions Affected

The drop in nonessential control air pressure caused the
essential control air system to automatically isolate from the
nonessential portion.

Operations personnel were dispatched to essential and
nonessential control air headers to determine the extent of
water intrusion. The essential control air system was found
isolated from the nonessential control air system. Air quality
was maintained downstream of the essential control air dryers.

E. Method of Discovery

Steam flow-feedwater flow mismatch and low feedwater level in the No. 3 steam generator were annunciated on the main control room panels, informing the operators of a potential trip condition. The turbine trip, reactor trip, feedwater isolation, and auxiliary feedwater start were annunciated on the control room panels.

F. Operator Actions

Control room personnel responded as prescribed by emergency procedures. They promptly diagnosed the plant condition and took actions necessary to stabilize the unit in the hot standby condition (Mode 3).

G. Safety System Responses

Safety systems performed and plant parameters responded as expected for a high-high steam generator level turbine trip and subsequent reactor trip. The steam generator power-operated relief valves for Loops 2 and 4 had indications of having momentarily opened. Heat removal was provided by steam flow to the condenser through the steam dump valves. Both main feedwater pumps tripped on the feedwater isolation signal terminating feedwater flow, and auxiliary feedwater (AFW) started as designed. AFW flow to the steam generators continued, and levels stabilized as expected.

III. CAUSE OF THE EVENT

A. Immediate Cause

The reactor trip was precipitated by a turbine trip. The turbine tripped as a result of high-high feedwater level in the No. 3 steam generator.

B. Root Cause

The high-high feedwater level in the No. 3 steam generator occurred when the operator selected manual control of the Loop No. 3 FRV and the FRV failed open. The controller was placed in manual as a result of secondary system perturbations because of inadvertent water intrusion into the nonessential control

air system. The controller malfunction was caused by the automatic-manual switching relay (K-1) not changing state. This resulted in the valve going to the full open position when the operator went from automatic to manual control.

C. Contributing Factors

Water introduced into the nonessential control air system was condensate accumulation in the No. 2 receiver because of sediment build-up obstructing the drain line. The sediment was a result of scaling in the nonessential control air system carbon steel piping and equipment between the compressors and receiver tanks. The ineffective blowdown technique failed to maintain the drain line clear of obstructions.

IV. ANALYSIS OF EVENT

The water entrainment affected the Unit 1 FRVs in normal control; however, the safety-related feedwater isolation function was not affected. The water intrusion was largely limited to secondary plant systems and components. The secondary side transients induced by the water entrainment were mitigated through the as-designed protective secondary plant runbacks on both units. The Unit 2 FRVs were not adversely affected by the water intrusion event.

Operability of other safety-related nonessential components was not affected. Automatic isolation of the essential control air system ensured operability of safety-related components that are required for safe shutdown of the plant.

Plant response during and after the trip as a result of the K-1 relay not changing state was consistent with responses described in the final safety analysis report and, accordingly, the event did not adversely affect the health and safety of the public.

V. CORRECTIVE ACTIONS

A. Immediate Corrective Action

Control room personnel responded as prescribed by emergency procedures. They promptly diagnosed the plant condition and took actions necessary to stabilize the unit in a safe condition.

An action plan was implemented to remove entrained water, restore affected equipment, and return the nonessential control air system air quality to normal service conditions. The Nos. 1 and 2 nonessential control air receivers were accessed and cleaned, and drain lines were cleared or replaced. The blow-down procedures were revised to ensure that the air receivers are adequately blown down.

B. Corrective Action to Prevent Recurrence

Troubleshooting performed on the Loop No. 3 FRV FIC found that the output stayed high whether the controller was in automatic or manual; the K-1 relay did not change state. This relay had been replaced during the previous refueling outage. The K-1 relay was removed and replaced with a new component. The controller was tested, found working properly, and returned to service. Additionally, the K-1 relays in the FRV FICs for Loop Nos. 1, 2, and 4 were removed and replaced with new relays. These controllers were tested, found working properly, and returned to service. A failure analysis is being performed on the K-1 relay, and attempts to duplicate the relay failure to this point have not been successful.

A preventive maintenance procedure was written to remove the control and service air receivers from service for cleaning of debris. The nonessential control air receiver inlet and outlet piping will be reviewed for adequacy of design. An independent assessment of site programs and program implementation to address Significant Operational Event Report 88-01 and NRC Generic Letter 88-14, including consideration of lessons learned from this event, is being performed.

VI. ADDITIONAL INFORMATION

A. Failed Components

The failed component in this event was the automatic-manual switching relay (K-1) in a Foxboro 62H controller. The relay is Foxboro Part No. N0196ZN, a Potter and Brumfield series KHAU relay with a 48-volt direct-current coil.

B. Previous Similar Events

One previous LER (327/91027) was identified that was associated with a controller failure. The controller failure was a result of a pressure controller and controlling potentiometer. Causes

and corrective actions for that event are not associated with the controller failure described in this LER.

VII. COMMITMENTS

None.

TVA
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J. L. Wilson
Vice President, Sequoyah Nuclear Plant

November 24, 1992

U.S. Nuclear Regulatory Commission

ATTN: Document Control Desk
Washington, D.C. 20555

Gentlemen:

TENNESSEE VALLEY AUTHORITY - SEQUOYAH NUCLEAR PLANT UNIT 1 - DOCKET NO.
50-327 - FACILITY OPERATING LICENSE DPR-77 - LICENSEE EVENT REPORT (LER)
50-327/92018

The enclosed LER provides details concerning an automatic reactor trip and engineered safety feature actuation (auxiliary feedwater start and feedwater isolation) during power operation. This event is being reported in accordance with 10 CFR 50.73(a)(2)(iv) as a condition that resulted in the automatic actuation of engineered safety features, including the reactor protection system.

Sincerely,

J. L. Wilson

Enclosure
cc: See page 2

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